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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re the Application of: August W. Gutheim and L. Thomas Lane

Docket No.: 210_591

Ser. No.: 10/619,242

Patent No.: 6,820,434 B2

Filed: July 14, 2003

Issued: November 23, 2004

For: REFRIGERANT COMPRESSION SYSTEM WITH SELECTIVE SUBCOOLING

Certificate
DEC 14 2004
of Correction

REQUEST FOR CERTIFICATE OF CORRECTION
PATENT OFFICE ERROR

I hereby certify that this correspondence is being deposited by Express Mail EV511846047US to the United States Postal Service addressed to Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450, Attn: Certificate of Correction on Dec. 8, 2004.

Evelyn B. Hall

Evelyn B. Hall

Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450
Attn: Certificate of Correction

Sir:

Receipt of the above-identified patent is hereby acknowledged.

In checking the original patent against our file, however, one (1) minor error was noted. On Claim 1. the last three words should have been omitted. Please review our Amendment dated June 18, 2004, a copy is attached.

It is, therefore, requested that a Certificate of Correction be issued as per the attached form PTO 1050 submitted herewith in duplicate.

The Commissioner is hereby authorized to charge any additional fees associated with this communication or credit any overpayment to Deposit Account No. 50-0289. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

WALL MARJAMA & BILINSKI LLP

By: _____

Dana F. Bigelow
Reg. No. 26,441

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DEC 14 2004

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO : 6,820,434 B1

DATED : November 23, 2004

INVENTOR(S) : Gutheim et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

CLAIMS

Claim 1. Column 5, Line 22, after the word section the phrase "of said compressor" should be omitted.

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PATENT NO. 6,820,434 B1

No. of additional copies

⇨1 of 1

DEC 14 2004

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Practitioner's Docket No.: 210_591 ***PATENT***

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of: August W. Gutherim et al.

June 18, 2004

Serial No.: 10/619,242 Art Unit: 3744

Filed: July 14, 2003 Examiner: Norman, Marc E.

Confirmation No.: 5829

For: REFRIGERANT COMPRESSION SYSTEM WITH SELECTIVE SUBCOOLING

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail addressed to Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on June 18, 2004

Christine M. Holmes

AMENDMENT AND RESPONSE

Sir:

In response to the Office Action mailed from the United States Patent and Trademark Office on March 29, 2004 please amend the above-identified application as follows:

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks/Arguments begin on page 6 of this paper.

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the above-captioned patent application:

Listing of Claims:

1. (Currently Amended) A vapor compression system comprising:

a single stage compressor having first and second sections connected in parallel with each having a suction inlet and both discharging to a single discharge port ~~for receiving low pressure refrigerant vapor at a first suction inlet and for discharging high pressure vapor~~;

a condenser for receiving ~~the~~ high pressure vapor from said discharge port and converting at least a portion thereof to a lower temperature liquid;

an expansion device for receiving said liquid and expanding it to a lower pressure vapor;

an evaporator for receiving said lower pressure vapor at a low temperature and delivering it to said first section ~~said compressor~~ at a higher temperature; and

a subcooler for receiving a portion of said liquid refrigerant from said condenser to subcool another portion of said liquid refrigerant passing from said condenser to said expansion valve, said subcooler being fluidly connected to [[a]] second ~~suction inlet~~ section ~~of said compressor~~.

2. (Cancelled)

3. (Currently Amended) A compression system as set forth in claim [[2]] 1 wherein said compressor is a multi-cylinder compressor and each of said two sections is driven by separate cylinder groups.

4. (Original) A vapor compression system as set forth in claim 3 wherein one section is driven by a plurality of cylinders and another section is driven by a single cylinder.

5. (Original) A compression system as set forth in claim 4 wherein a circuit containing said subcooler is driven by a single cylinder.

6. (Currently Amended) A compression system as set forth in claim [[2]] 1 and including unloading circuits in at least one section to fluidly interconnect a high pressure side to a low pressure side of said compressor.

7. (Original) A compression system as set forth in claim 1 wherein said subcooler has associated therewith an isolation valve which may be closed to effectively remove the subcooler from operation.

8. (Original) A compression system as set forth in claim 1 and including a subcooler expansion device upstream of said subcooler.

9. (Original) A compression system as set forth in claim 1 and including a check valve posed between said subcooler and said second suction inlet.

10. (Currently Amended) A method of selectively boosting the capacity of a vapor compression system having a single stage compressor, a condenser, an expansion valve and an evaporator comprising the steps of:

providing first and second ~~suction inlets~~ sections to said compressor said first and second sections connected in parallel with each having a suction inlet and both discharging to a single discharge port;

providing a subcooler to receive a first portion of refrigerant from the condenser to cool a second portion of refrigerant from the condenser prior to its flow to the expansion valve; and

providing for the flow of said first portion of refrigerant from said subcooler to said second ~~suction inlet~~ section.

11. (Currently Amended) A method as set forth in claim 10 and including a step of delivering refrigerant from said expansion valve to said first ~~suction inlet~~ section.

12. (Currently Amended) A method as set forth in claim 11 and including the step of applying multiple cylinders to compress the refrigerant being delivered to said first ~~suction inlet~~ section.

13. (Currently Amended) A method as set forth in claim 13 and including the step of applying a single cylinder of said compressor to compress the refrigerant being delivered to said second ~~suction inlet~~ section.

14. (Currently Amended) A vapor compression system for a refrigerated vehicle, comprising:

a single stage compressor for receiving a low pressure refrigerant vapor and delivering a high pressure refrigerant vapor, said compressor having first and second sections, connected in parallel with each having a suction inlet and both discharging to a single discharge port; ~~each of which is capable of compressing refrigerant vapor;~~

a condenser for receiving refrigerant vapor from said compressor and delivering liquid refrigerant;

an expansion valve for receiving at least a portion of said liquid refrigerant and converting it to a low pressure refrigerant vapor;

an evaporator for receiving low pressure refrigerant vapor from said expansion valve and delivering higher temperature refrigerant vapor to said first ~~compression~~ section; and

a subcooler for receiving a portion of said liquid refrigerant from said condenser to subcool said portion of said liquid refrigerant passing to said expansion valve, said subcooler being fluidly connected to said compressor second section.

15. (Original) A system as set forth in claim 14 wherein said subcooler is connected to selectively provide for the flow of refrigerant to said second section.

16. (Cancelled)

17. (Original) A system as set forth in claim 14 wherein said first section has multiple reciprocating cylinders.

18. (Original) A system as set forth in claim 14 wherein said first section has at least one unloading circuit.

19. (Original) A system as set forth in claim 14 wherein said second section includes a single reciprocating cylinder.

REMARKS/ARGUMENTS

Claims 1-5, 7, 8, 10-17 and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Dormer et al. (U.S. 5,768,901). Claims 6 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dormer et al in view of Lifson et al (U.S. 6,058,729). Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dormer et al.

In response, the applicants have reviewed the cited references in detail and believe that the claims, as amended, are patentably distinctive thereover for the reasons to be discussed hereinbelow.

The present invention relates to a single stage compressor for a transport refrigeration system which operates primarily in a low capacity mode but at times, requires higher capacity performance. These needs are meet by a single stage compressor with two sections, with one section being connected to the main system evaporator and the other section being connected to a subcooling evaporator. One or more unloading circuits are provided in the main section of the convention system such that the compressor can be unloaded during periods of low capacity demand. An isolation valve and expansion device are in the subcooler unit so as to allow for control and isolation of the subcooler when not required. A multiple cylinder reciprocal compressor is provided with one or more cylinders being dedicated to use in the subcooler circuit while the other cylinders are dedicated to the main evaporator circuit.

The advantage of such a system is that it is adaptable to provide the very large operating range that is required in a transport refrigeration system. That is, while the temperature of the box may be within the range of 55°F to -20°F and the operating range may be from -40°F to +125°F, the present arrangement allows for one section to be used most of the time but the other section to be brought in when needed to meet these requirements. In doing so, however, the capacity of the system is reduced.

Each of the cited references relate to a two stage compressor with an economizer. Such a system is discussed in paragraph [0005] of the applicant's specification as being one of those which is relatively complex, expensive, and difficult to maintain. Whereas two stage compressor systems are common in commercial refrigeration, they are not generally used in transport refrigeration because they are not adaptable to operate in the environment as described hereinabove. In this regard, they would tend to provide either to much or too little capacity. For that reason, two stage compressors have not been found to be technically feasible in the transport refrigeration industry.

In the Dormer reference, on which the Examiner relies for rejection for each of the claims, there are, in fact, to sections of the compressor (i.e. LS and HS) as indicated by the Examiner. However, this is a typical two stage compressor wherein the refrigerant passes first through one section and then through the other section connected in serial flow relationship, with only the latter section being connected to discharge to the discharge port. In contrast, the applicant's invention provides for a single stage compressor with first and second sections connected in parallel, with each having a suction inlet and both discharging to a single discharge port. As will be seen from the discussion above, this is substantially different from the arrangement of the cited references.

Because of these substantial differences which are now recited in each of the independent claims, the applicants believe that the claims are patentably distinctive over the cited references. A reconsideration of the Examiner's rejections and a passing of the case to issue is therefore respectfully requested.

If the Examiner wishes to expedite disposition of the above-captioned patent application, he is invited to contact Applicant's representative at the telephone number below.

The Commissioner is hereby authorized to charge any additional fees associated with this communication or credit any overpayment to Deposit Account No. 50-0289.

Respectfully submitted,

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